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DRAFT

T E S III

TECHNICAL ENFORCEMENT SUPPORT AT HAZARDOUS WASTE SITES

U.S. EPA CONTRACT NO. 68-01-7331

CDM Federal Programs Corporation

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EXECUTIVE SUMMARY

A remedial investigation and the beginnings of a feasibility study (FS) have been conducted in three phases at the Universal Oil Products (UOP) site in East Rutherford, New Jersey. Volatile and semi-volatile compounds are widespread in high concentrations at the site. Polychlorinated biphenyls and inorganics are found in several areas of the site.

The extent of contamination has not been determined horizontally or vertically and appears to extend beyond the site boundaries. The potential impacts of contamination on a lower water resource aquifer have not been determined and the sources of contamination have not all been located. An endangerment assessment has been prepared on segments of the site only and does not fully consider the nature of contamination.

NJDEP has seemingly entered into an agreement with UOP that does not comply with the National Contingency Plan FS process by studying the implementability of bioremediation of heavily contaminated lagoons at the site without having formally evaluated other potential remedial alternatives.

The final conclusion drawn by the UOP consultants, and the CDM FPC response to these comments is summarized in Section 3.3.4 beginning on page 29.

1.0 INTRODUCTION

CDM Federal Programs Corporation (CDM FPC) has been requested to provide enforcement support to the U.S. Environmental Protection Agency (EPA) Region II by conducting a technical and regulatory review of documents relating to the Universal Oil Products (UOP) site located in East Rutherford, New Jersey. In July and August 1987, CDM FPC met with EPA and the New Jersey Department of Environmental Protection (NJDEP) to obtain documents and background information on the site. Subsequently, CDM FPC contacted UOP in Desplaines, Illinois, and the two UOP technical consultants, Geraghty and Miller, Inc. (G&M) in Plainview, New York, and ERT, Inc. in Concord, Mass., to obtain further documentation and information on the site. The analysis presented in this report is based on those documents (listed at the end of this report), and on information provided by EPA, NJDEP, UOP, G&M, and ERT.

UOP's predecessor, Truebeck Laboratories, produced aromatic chemicals beginning in 1932, and used the property for the recovery of solvents and waste chemicals produced between 1960 and 1979 (operating life under UOP ownership). The UOP decided to raze the site in late 1980. Due to documented soil, ground water, surface water, and soil contamination, a remedial investigation and feasibility study (RI/FS) is being performed by UOP consultants under a series of Administrative Orders issued by the State of New Jersey. UOP is currently conducting Phase III of the field investigation and has commenced studies on potential remediation of several parcels of the site.

The purpose of this technical review is to ensure that this state-lead project has been conducted, and is currently proceeding, in a manner consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and EPA RI/FS guidance. Ultimately, these regulatory controls will need to be satisfied before the site can be deleted from the National Priorities List (NPL).

1.1 TECHNICAL OVERSIGHT

CDM FPC reviewed EPA and NJDEP documents pertaining to UOP for their integrity, accuracy, and completeness. CDM FPC has evaluated whether the activities conducted thus far have been technically viable and the analyses made and conclusions drawn valid. The technical information reviewed includes data collected by UOP consultants that characterize site features, hazardous substances present, hydrogeology, geology, surface water, ground water, air, and public endangerment.

1.2 REGULATORY OVERSIGHT

CDM FPC evaluated the work performed thus far at the UOP facility for compliance with applicable regulatory and statutory requirements. This included a review of documents on the UOP facility for compliance with EPA's RI/FS guidance and with the requirements of CERCLA, SARA, and the NCP as they apply to UOP. A brief summary of each of these regulatory controls

is presented below.

Under CERCLA, EPA has the authority and responsibility for responding to uncontrolled releases of hazardous substances. CERCLA established "Superfund" for financing the cleanup of uncontrolled hazardous waste sites, and required that procedures be established to evaluate remedies, to determine the appropriate extent of the remedy, and to ensure that remedial measures are cost effective.

SARA went further than CERCLA in defining 1) the involvement of the state in which a release has occurred, 2) the selection of a remedial action, 3) removal actions, and 4) public participation in the selection of a remedial action. §121 permanent remedies, ARARS

The NCP refines definitions for an RI/FS, response actions (removal and remedial), and operable units. Response at a CERCLA site can occur as a removal or a remedial action; the difference being that a remedial action is a permanent measure taken to minimize further release of hazardous substances and to prevent migration. A removal action is taken to minimize or mitigate immediate damage to the public health, welfare, or the environment.

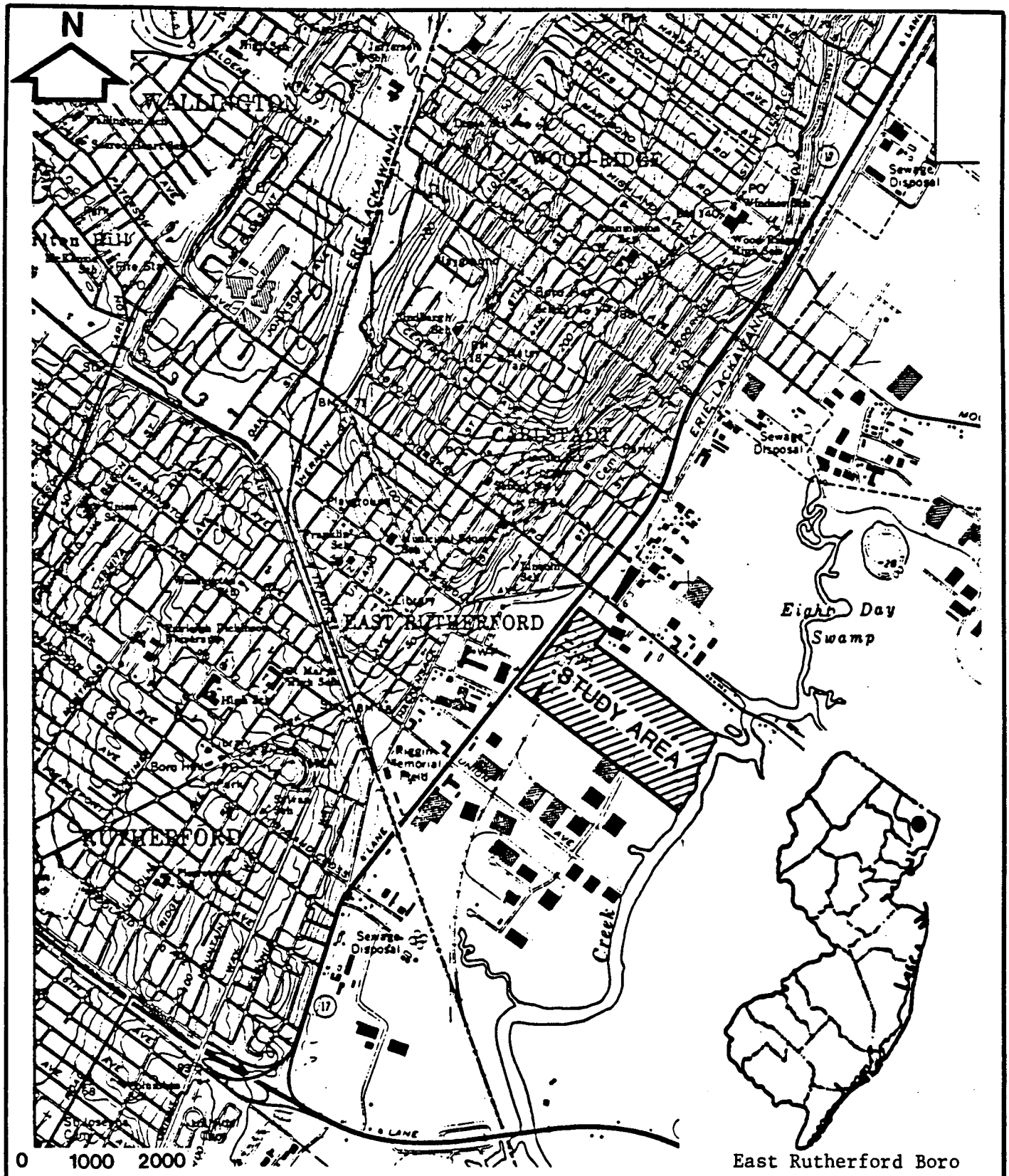
The NCP stipulates that the source and nature of contamination at the site be determined. An RI/FS shall be undertaken prior to implementing a remedial action to determine the nature and extent of contamination and the threat presented by the release and to evaluate proposed remedies.

The 1985 EPA RI/FS guidance document is a broad agency interpretation of CERCLA and the NCP. The document is intended to provide a more detailed structure for field studies involving data collection.

1.3 SITE DESCRIPTION

The UOP site is located in East Rutherford, New Jersey, near Routes 17, on a relatively flat 75-acre tract of land, within the coastal wetlands management area of the Hackensack river basin (Figure 1). About 33 acres were used for the plant facility.

The site has been divided into six study areas (1, 1A, 2, 3, 4, and 5) on the basis of physical characteristics as shown in Figure 2. Areas 1 and 1A are in the north and central portions of the site and comprise a tank farm area and intervening terrain toward Area 3. Area 2 comprises 3 acres in the western portion of the site between the railroad and New Jersey Route 17. The foundations of former production plants, research buildings, storage buildings, the boiler plant, and a sewage treatment facility are situated here. Above and below ground storage tanks were also once located in this area. Area 3 has historically been the focal point of most of the RI/FS activities at the site and contains two waste water sludge lagoons. Area 4 comprises the surface water which is potentially affected by the UOP site. This includes Ackermans Creek and the marshy areas contiguous with the on-site stream channels. Area 5 includes 7 acres in the east-central portion of the site. No structures are know to have been built here, and the area is now overgrown with dense marsh vegetation. During the



East Rutherford Boro
Bergen County
SOURCE: NJDEP

Figure 1

Location Map

UOP Site
East Rutherford, New Jersey

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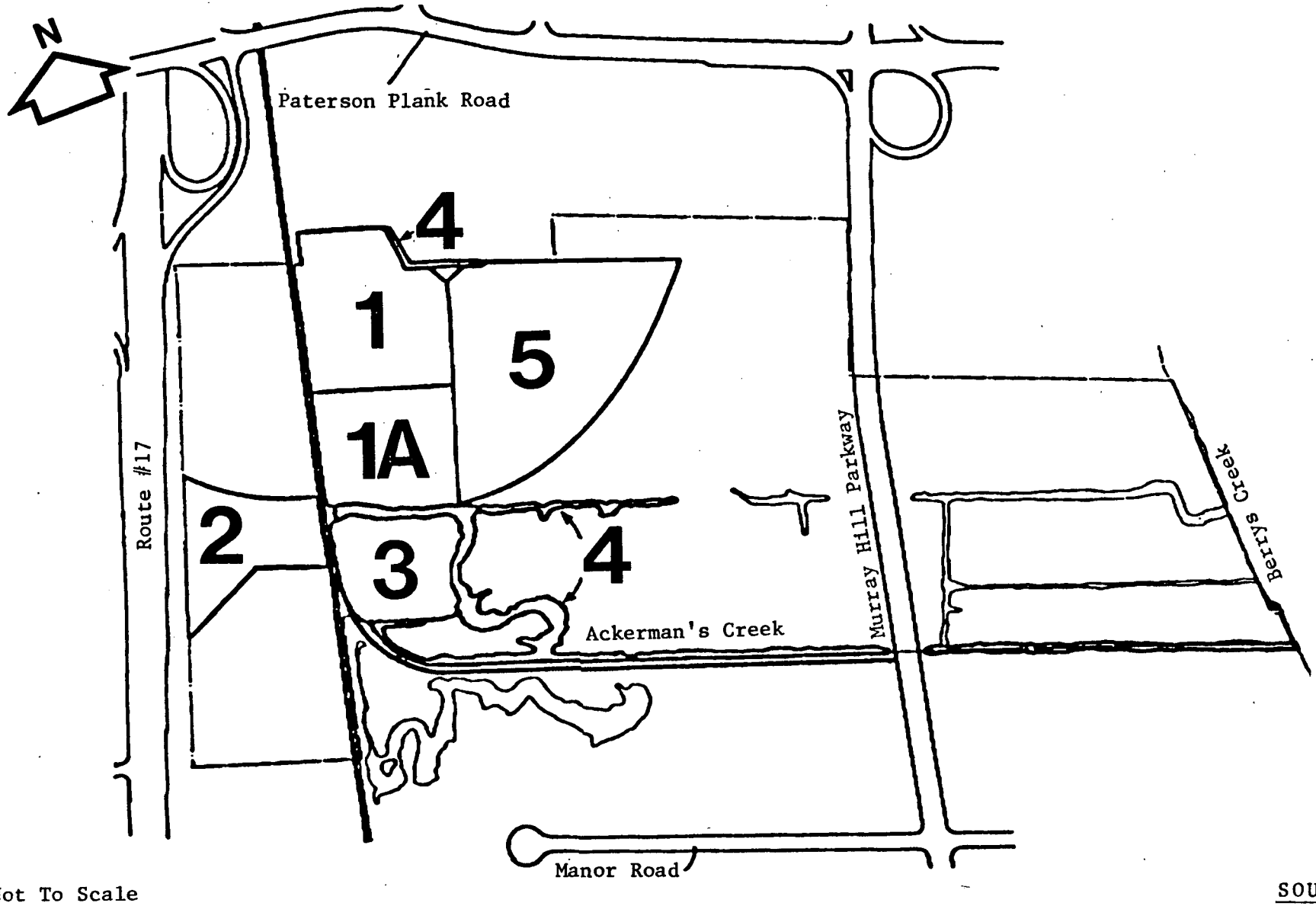

Not To Scale

SOURCE: UOP

Figure 2

Facility Map

UOP Site
East Rutherford, New Jersey

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installation of monitoring wells, NJDEP and G&M representatives confirmed the presence of a landfill in this vicinity. Evaluation of aerial photographs of the site from 1940 to 1979 indicate that several drum storage areas were also situated in Area 5.

1.4 SUMMARY OF UOP ACTIVITIES

Since 1980, UOP has been working with various consultants in three phases of work to perform the necessary investigations as required by three Administrative Consent Orders (ACO) and two Addendums to an Administrative Consent Order (AACO) issued by NJDEP.

The ACO first sent in January 1981, was addressed as UOP hired a consultant, Geraghty and Miller, Inc. (G&M) to investigate the site hydrogeology and to determine the nature, extent, impact, and source(s) of contamination.

In August 1982, a second ACO was issued by NJDEP requiring more extensive ground and surface water monitoring and information regarding the location and contents of old landfills, lagoons, and storage tanks. A third ACO was signed on July 29, 1983 for UOP to conduct further studies in an RI (Phase I).

An AACO (to the ACO of July 29, 1983) was issued in September 1984. UOP agreed to conduct further studies to satisfy NJDEP's requirements for an RI/FS. The study was to consider findings from the Phase I investigation, obtain additional data, and conduct an initial screening and evaluation of potential remedial action alternatives. On June 3, 1985, UOP submitted the Phase II report.

In January 1986, NJDEP informed UOP that a Phase III RI was required prior to the initiation of an FS. The Phase II Investigation had identified areas of significant contamination in the soil, surface water, ground water, and sediments; however, it had failed to identify the sources and extent of contamination. NJDEP proposed that a final AACO (signed in May 1986) be used to negotiate the scope of Phase III RI/FS, the design and implementation of the response measures, and finances for such actions. In September 1986, field activities for Phase III of the RI were initiated.

Subsequent to the last AACO, UOP procured the services of a second consultant, ERT, Inc., to investigate the waste water lagoons (Area 3), the site surface water (Area 4), and to conduct an endangerment assessment (EA) in Areas 1, 1A, 2, and 5. The Phase III RI, the EA, and the FS work plan for Areas 1, 1A, 2, and 5 were submitted to NJDEP for review in May 1987. An FS has not been conducted on the waste water lagoons.

In September 1986, UOP submitted a Wastewater Lagoon Remedial Action Plan (Area 3), prepared by ERT, that called for excavation of the lagoons as soon as possible (ERT, 1987). Subsequently, although the work plan had already undergone NJDEP review, UOP, the consultants, and NJDEP agreed that bioremediation appeared to be a much more attractive potential response measure at the lagoons. UOP has since submitted a preliminary plan to NJDEP to further explore bioremediation at the lagoons and has also gone so far as to send lagoon sludge samples to a lab to determine the

design parameters that would be required in the event that bioremediation occurs. According to NJDEP, this bioremediation study at the lagoons will satisfy the requirements of SARA and the NCP.

In November 1986, UOP submitted the Stream Channel Pilot Study to NJDEP (Area 4), also prepared by ERT (ERT, 1986). After having gone through NJDEP review, the sediment sampling plan is set to begin upon NJDEP approval.

The Work Plan for an FS at Areas 1, 1A, 2 and 5 was submitted to the NJDEP on May 29, 1987. No further activities are scheduled by UOP in Areas 1, 1A, 2 and 5 until the NJDEP review of these documents is complete.

2.0 SITE CHARACTERISTICS

2.1 GEOLOGY AND HYDROGEOLOGY

The UOP site is located in the Hackensack River Basin. According to site-specific information provided by UOP, bedrock lies at depths of 125 to 135 feet below land surface (G&M, 1985). Underlying the UOP site is the Brunswick Formation, which is composed of shale, siltstone, and sandstone. Where highly fractured, the Brunswick Formation is a prolific source of ground water and is considered to be the principal aquifer throughout much of northern New Jersey. Figures 3 and 4 are geologic cross-sections of the site.

The lower 60 to 70 feet of alluvium varies from fine-grained sand to alternating beds of silt, fine-grained sand, and clay. Ground water in this unit may occur under semi-confined conditions in some places. The upper 55 to 70 feet of alluvium consists of clay with small amounts of silt and sand. The ground water in the upper 20 to 30 feet occurs under water table conditions. The upper-most unit is composed of 1 to 8 feet of fill, which is underlain in most places by 1 to 5 feet of peat. The water table occurs at 1 to 5 feet below the surface. Due to gentle water table gradients and low soil permeabilities, ground water moves slowly across the site (5 ft per year), and discharges primarily to surface water.

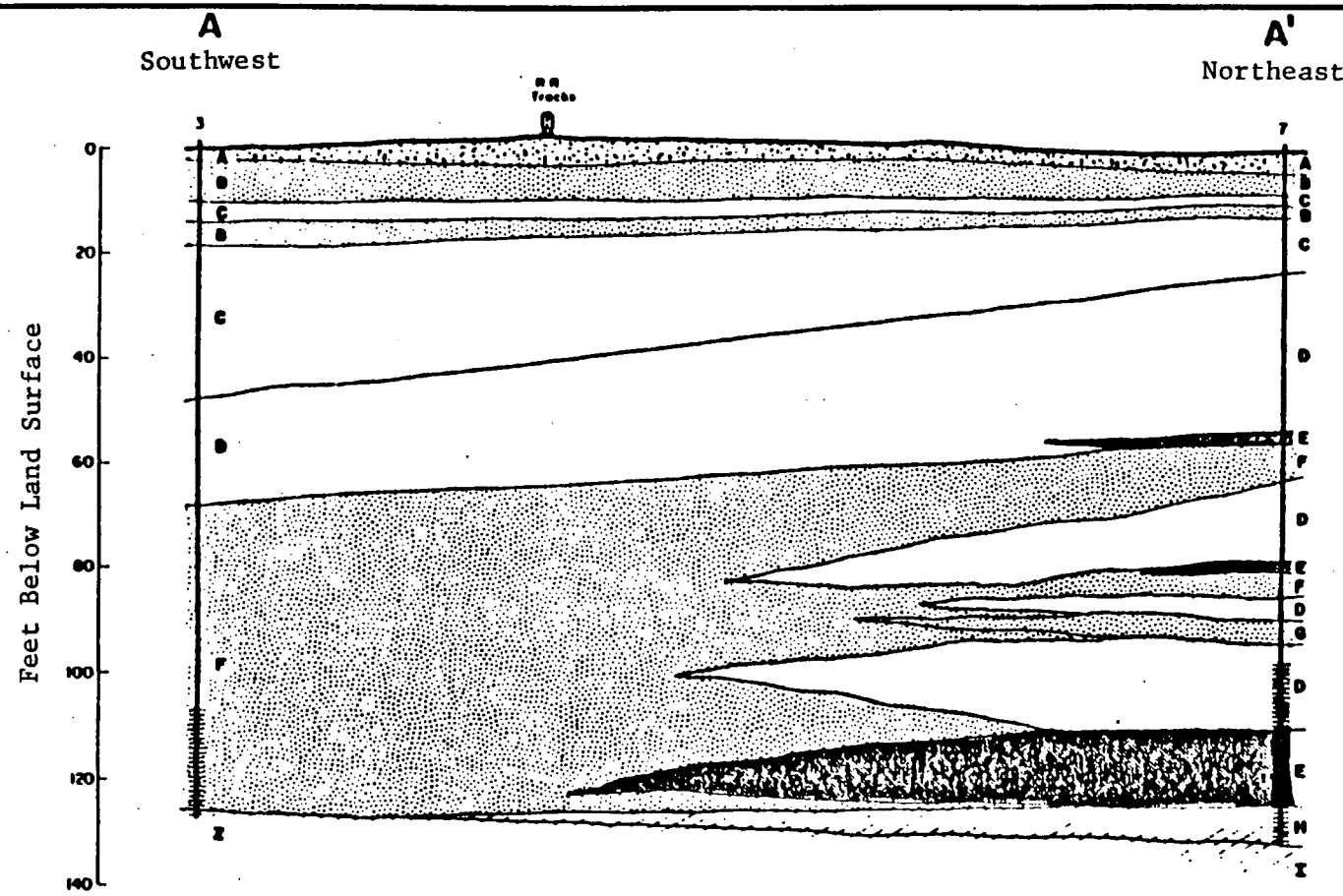
2.2 TOPOGRAPHY AND SURFACE WATER

The UOP site is located on a relatively flat tract of land (elevations vary from 4 to 9 feet above mean sea level) and is partially a tidal salt marsh. A system of natural and artificial surface water channels across the property allow drainage to the tidally-influenced Ackermans Creek. Ackermans Creek drains into Berry's Creek which is a tributary of the Hackensack River.

2.3 LAND USE AND ECONOMY

The UOP site, which is currently unused, is bounded by commercial and industrial property, marshland, and a busy thoroughfare (Route 17). Approximately one-half mile west of Route 17 is a residential area and a high school. The marshland portion of the site to the east has dense stands of Phragmites and a typical marshland understory. Sixty-five bird species and several mammals and amphibians have been sited in the meadowlands vicinity. The remainder of the site is discontinuously covered with building foundations, scrub-brush, and aged blacktop roadways. Some unvegetated areas and unpaved roadways also exist.

A high percentage of the properties along Route 17 and Paterson-Plank Road are used by commercial retail businesses, such as gasoline stations, a building supply store, an automobile dealership, office parks, and restaurants and hotels. The area west of the railroad tracks is within East Rutherford's jurisdiction and is zoned for industry and business. The area east of the railroad tracks is zoned for light industry. The site is close to the Meadowlands Complex, a suspected contamination area presently under considerable public scrutiny.



LEGEND:

A - Recent Deposits
B - Sand, Fine To Medium Grained
C - Clay, With Some Fine To Medium Grained Sand
D - Clay, Interbedded With Some Silt
E - Silt
F - Sand, Fine Grained, Interbedded With Lenses Of Clay
G - Sand, Fine Grained, With Some Silt
H - Shale, Weathered
I - Shale, Competent

Recent Deposits
Sand
Clay
Silt
Shale
Well Screen Interval

0 100
scale feet

SOURCE: Geraghty & Miller, Incorporated

Figure 3

Cross-Section A-A

UOP Site
East Rutherford, New Jersey

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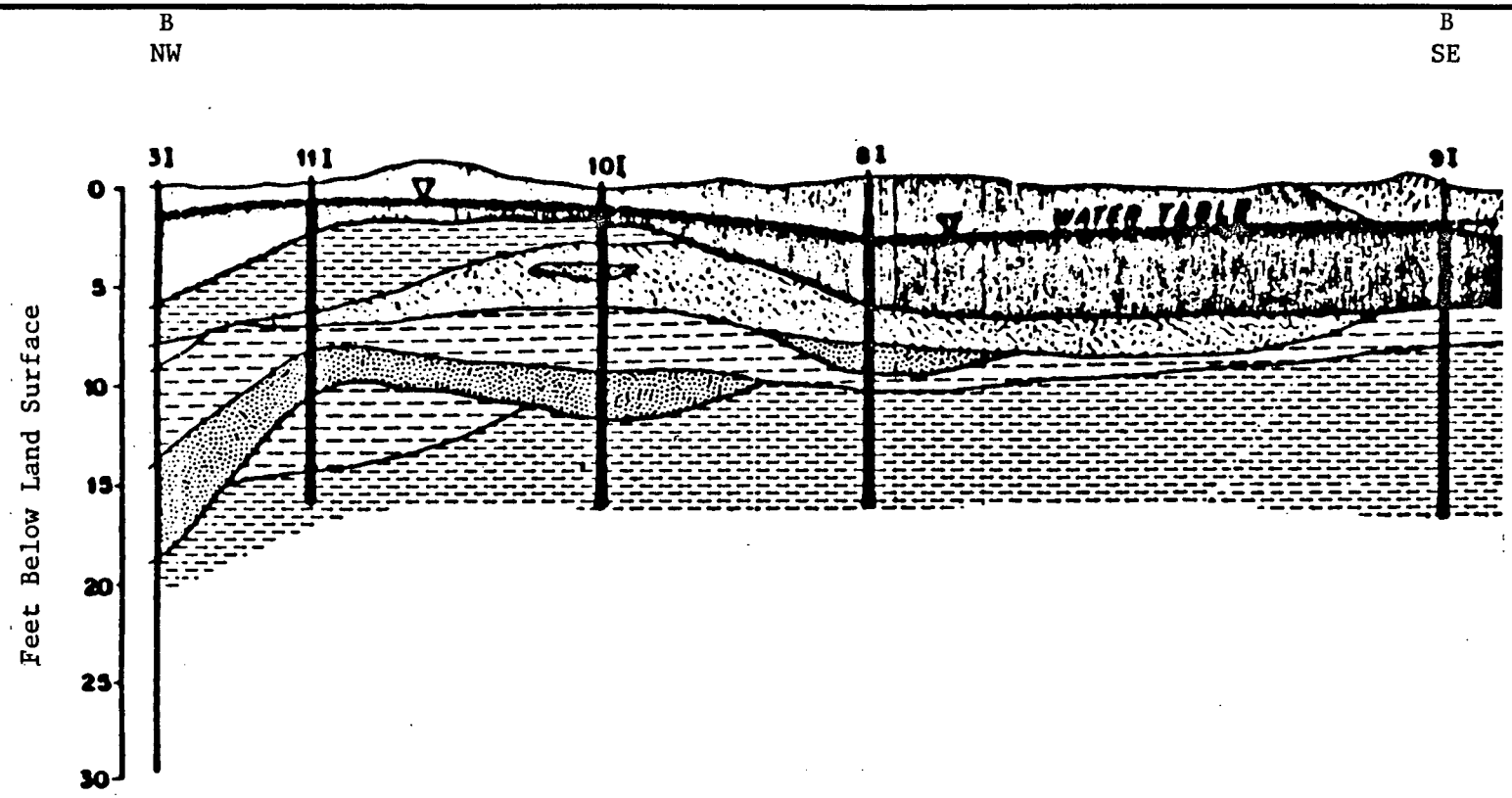

LEGEND:

- Recent Deposits
- Clay Interbedded With Sand
- Clay
- Meadow Mat
- Sand

0 300

scale feet

SOURCE: Geraghty & Miller, Incorporated

Figure 4

Cross-Section B-B

UOP Site
East Rutherford, New Jersey

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2.4 NATURE AND EXTENT OF CONTAMINATION

High levels and many types of contamination have been detected in the site soils, ground water, and surface water. Volatile organic compounds (VOCs) are prevalent in ground water and soils and in some areas occur at over 100,000 ppb. Lower levels are found in the stream sediments. Most of these are compounds are related to benzene, toluene, and chlorobenzene.

Base/neutral and acid extractable organic compounds (BNAs), primarily phenols, are found at over 10,000 ppb in the ground water, 100,000 ppb in soils, and at lower levels in surface water.

Polychlorinated biphenyls (PCBs) have been found at over 100,000 ppb in site soils and stream sediments. Arsenic, lead, chromium, and zinc have also been detected at low levels in all media.

2.5 EXPOSURE PATHWAYS

The primary concern at this site is the potential for off-site migration of contaminants in the deep aquifer. The deep aquifer is used as a source of drinking water for Wallington Township residents and as process cooling water for industries in the immediate area. The Wallington Township wells are located approximately 2.5 miles upgradient from the UOP site.

Some potential for exposure exists at the highly contaminated site soils (particularly Areas 1, 1A, 2, and 5) and at the waste water lagoons (Area 3).

3.0 TECHNICAL EVALUATION

This chapter reviews the work performed by UOP's consultants, summarizes their data and the interpretations drawn from this data, and finally, evaluates the technical integrity, accuracy, and completeness of their analyses. G&M performed the initial investigation beginning in November, 1983. Since then, UOP divided the site into 6 areas based on physical characteristics. G&M continued the RI in Areas 1, 1A, 2, and 5 and ERT was contracted to investigate Areas 3 and 4 and to do an FS and a Risk Assessment for Areas 1, 1A, 2, and 5, based on the results of the RI. It is unclear at this time whether an FS is scheduled for Areas 3 and 4. According to NJDEP, they have agreed to investigate bioremediation of Area 3, apparently without conducting a formal FS. However, all parties continue to refer to bioremediation of the lagoons as "remedial" rather than "removal".

3.1 METHODS OF ANALYSIS

Activities at UOP have been conducted by either G&M or ERT. In most cases, the data collected was stipulated by an NJDEP ACO. A review of work conducted by each consultant is presented below.

3.1.1 Geraghty & Miller, Inc.

Analytical work was performed in three phases during 1983-1986. Phase I field work was performed from November 1983 to March 1984. During this period, 16 wells, 5 staff gauges, and 7 soil borings were installed. G&M developed figures depicting the water table configurations, surface water flow patterns, and began to define contamination in ground water, surface water, soils, and surface water sediments. This data is summarized and interpreted in "Investigation of Ground water Conditions on Universal Oil Products, Inc.'s Site, East Rutherford, New Jersey, May 1984" (G&M, 1984).

Field work for the Phase II investigation was performed from October 1984 to February 1985. During this period, 15 wells were installed. The data developed include further characterization of soil, sediment and ground water contamination, and a sludge quality profile in the waste water lagoons. This data is summarized and interpreted in "Phase II Investigation, Water and Soil Conditions, UOP Site, East Rutherford, New Jersey, May 1985 " (G&M, 1985).

Field work for the Phase III investigation was performed from March 1986 to December 1986. During this period, 5 wells and 40 soil borings were installed. In situ permeability (slug) tests were performed on 8 wells. A magnetometer survey was done in Area 5 and 8 trenches were dug following the survey. The Phase III data included a characterization of soil and ground water contamination in Areas 1, 1a, 2, and 5, further characterization of Areas 1 and 5, and a further assessment of the site's hydrologic characteristics. This data is summarized and interpreted in "Remedial Investigation Report Area 1, 1A, 2, and 5 UOP Site, East Rutherford, New Jersey, May 1987" (G&M, 1987).

The work performed by UOP's second consultant, ERT, as described in the

next section, is also included under the Phase III investigation.

3.1.2 ERT, Inc.

ERT has focused their efforts on studying potential remedies at the waste water sludge lagoons in Area 3, developing a sampling plan for stream sediments (Area 4), and conducting an EA at Areas 1, 1A, 2, and 5.

Originally, the wastewater sludge lagoons were slated for excavation and disposal at an off-site facility. ERT went as far as preparing a work plan outlining the activities necessary to determine the feasibility of doing this ("Waste Water Lagoons Remedial Action Work Plan, UOP Site, East Rutherford, New Jersey", ERT, 1986). NJDEP and UOP have since dropped excavation of the lagoons as a potential remedy and begun investigating bioremediation.

ERT is now studying two possible approaches to bioremediation. In the liquid matrix, sludge is added to a liquid bioreactor, if necessary, to produce a loading capacity that will provide the fastest biodegradation rate when appropriate nutrients are added. In the solid matrix, clean soil is added to the sludge. At this time, samples are now at a laboratory being analyzed to determine if, in fact, bioremediation can work at UOP, and if so, the design parameters that may need to be considered.

ERT has also been studying methods for determining polychlorinated biphenyl (PCB) concentrations in the stream water and sediments. However, it is unclear whether this is to be used in determining the existing contamination or in developing a monitoring plan. The September 1986 work plan for the UOP site required that a pilot study be implemented to evaluate the accuracy and efficiency of a McGraw-Edison PCB field test kit. Soil samples are analyzed by the test kit in a three-step process that involves adding solvent to the soil, adding an extraction solvent, and then measuring the PCB concentration. The PCB concentration measured in the test is dependent on the Aroclor in the sample. A simultaneous analysis for PCB was performed at ERCO Laboratories in New Jersey. The data are summarized and interpreted in "Pilot Study for McGraw Edison PCB Field Test Kit and Stream Sediment Sampling" (ERT, 1987). Based on the results of the pilot study, ERT proposed a revised stream sediment sampling plan. According to this plan, samples will be obtained from borings and grab samples.

ERT performed an EA at Areas 1, 1A, 2, and 5 based on the field observations and analytical data presented in the G&M RI (see "Risk Assessment Report, Areas 1, 1A, 2, and 5, UOP site, East Rutherford, New Jersey", ERT, May 1987). The methods for the EA follow the guidance provided in the Superfund Public Health Evaluation Manual (SPHEM, EPA, 1986).

According to ERT, the results of the RI and the EA were used to develop the "Feasibility Study Work Plan, Areas 1, 1a, 2, and 5, UOP Site, East Rutherford, New Jersey,"(ERT, 1987). The plan is based on ERT's findings of the EA, and states that only Areas 2 and 5 possess a potential threat to public health.

3.2 FINDINGS

During Phase I, II, and III of the RI, G&M and ERT analyzed ground water contours and ground water, soil, surface water, stream sediment, and lagoon sludge samples for several parameters (in accordance with the ACO). These include: VOCs, BNAs, metals and cyanide, pesticides and PCBs, and several other conventional water quality parameters. The data can be found in the Phase II and III reports by G&M, and the Phase III reports by ERT (ERT, January 1987; G&M, 1987). Sampling and analysis was performed in accordance with previously established protocols and approved by NJDEP. G&M submitted their sample to Measurement Sciences Corporation, Garden City, New York. ERT submitted their samples to ERCO Laboratory, Cambridge Massachusetts. Their conclusions are summarized here.

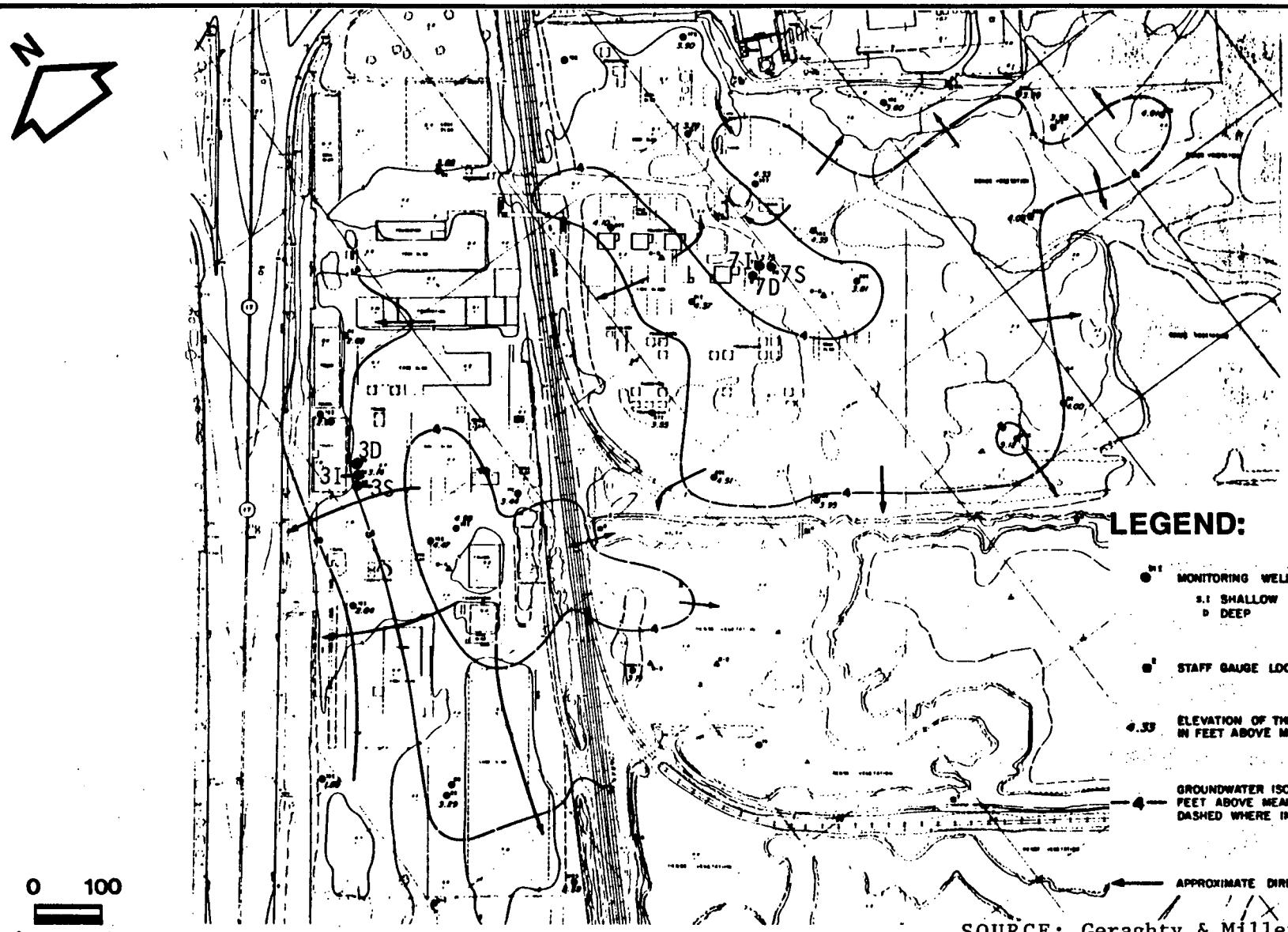
3.2.1 Hydrogeology

G&M has determined that the upper 20 feet of overburden at the UOP site is composed of clay, silt, and fine sand. In addition to near surface deposits of the sand, silt, and clay are peat (meadow mat) deposits which contain thin seams of silty clay. Ground water occurs at depths of between one and five feet below land surface across the study area and is under water table conditions in the upper 20 to 30 feet of the overburden. G&M has determined that a clayey unit, which extends from approximately 20 to 60 feet below grade, is confining the basal sand and silt deposits, and that ground water in the basal deposits is under semi-confined conditions. The basal sand and silt deposits are found at depths of between 60 and 130 feet below land surface. Well logs and geologic cross-sections upon which G&M based these conclusions can be found in the Phase II report.

During Phase I, G&M measured permeabilities of 8.6 x 10-3 cm/sec for the fine-grained sand to 1.2 x 10-7 cm/sec for the silty clay. G&M estimates permeabilities for the peat of between 1 x 10-6 cm/sec and 1 x 10-7 cm/sec. The clay unit has a permeability of 1 x 10-7 cm/sec. Based on low permeability values and gentle water table gradients, G&M concluded that ground water moves slowly across the site, typically 5 feet per year. The permeability of the lower sands is not known.

According to G&M, the differences of 0.5 to 2.5 feet in water level measurements observed between deep and shallow Wells 3D and 3S and 7D and 7S, (Figure 5) respectively, indicate a vertical hydraulic gradient in the overburden. G&M has further suggested that such a vertical gradient might serve as protection of the deep aquifer at the site by preventing migration of contaminant downward. This conclusion is drawn on only two well sets. Also, this hypothesis has not been supported by sampling results of the deeper aquifer.

Water table contour maps accompanying the Phase I, II, and III reports indicate that there are two localized shallow aquifer recharge zones and that ground water is discharging to the surface water bodies around the site (Figure 5). One recharge zone occurs within Areas 1, 1A, and 5, and the other recharge zone occurs within Areas 2 and 3. The overall pattern, as defined by G&M, includes a component of flow to the north west. The recharge zone for the deeper aquifer is presumably off-site.



SOURCE: Geraghty & Miller, Incorporated

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Figure 5

Water Table Contours

UOP Site
East Rutherford, New Jersey

3.2.2 Nature And Extent of Contamination

Contamination at the UOP site falls into four groups: VOCs, BNAs, PCBs, and inorganics.

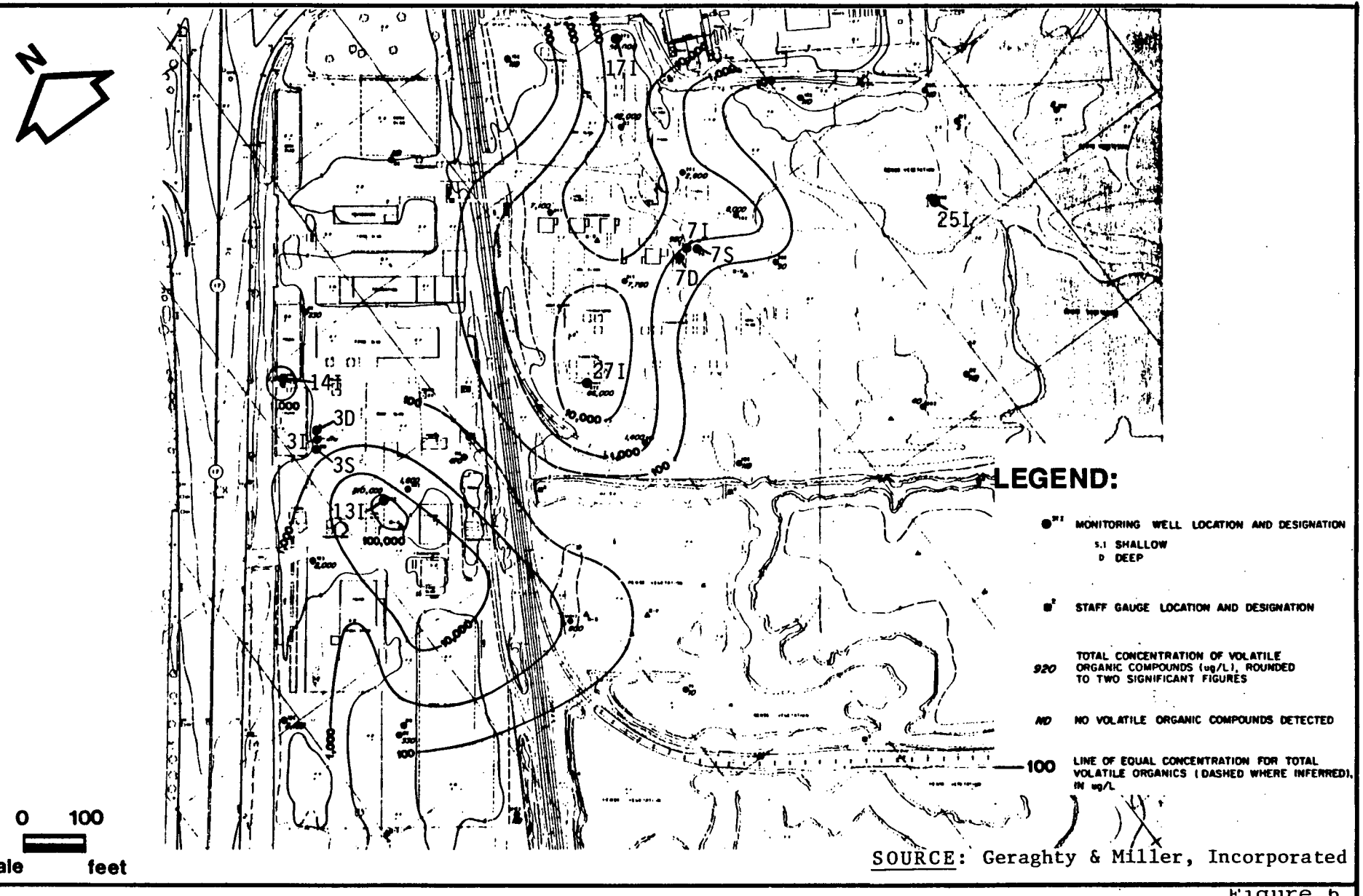
3.2.2.1 VOCs

In the shallow aquifer, VOCs account for more than three quarters of the organics in ground water (in the areas with the highest total organic concentrations). Benzene, toluene, and chlorobenzene are the prominent VOCs. From Figure 6, it appears that there are 3 significant areas of high VOCs. Although closer inspection of the figure reveals that G&M may have erroneously neglected to include a 100 ppm isopleth around Well 25I in Area 5 indicating that perhaps a fourth isolated plume of contamination exists there. From Figure 6, it appears that VOCs are concentrated in Areas 1, 2, and 1A. The highest concentrations were found at Wells 13I (210,000 ppb), 27I (66,000 ppb), and 17I (56,000 ppb). Contamination appears to extend significantly northward and westward (downgradient) from these wells, although at this time it is not known how far. Finally, an isolated pocket of VOCs (1600 ppb) appears at 14I in Area 2. While the interpretive isopleths that G&M has placed on their map identify this as an apparently isolated plume, it could also be interpreted as falling within the plume surrounding Well 13I.

Benzene appears to be the most commonly detected organic contaminant in the shallow aquifer (present in 38 percent of all surface and ground water samples), however, significant quantities of toluene, xylene, chlorobenzene, other benzene and toluene related compounds, and tetrachloroethylene (PCE) and its related compounds (trichloroethylene, TCE, and dichloroethylene, DCE) are also found.

Sampling of the deeper aquifer occurred one time each in the two deep wells during Phases I and II. Low levels of DCE and TCE were detected in Well 3D during both events, although the levels were slightly higher in the second round (53 to 63 ppb DCE). Also, more varieties of contaminants were detected during the second round, although at very low levels. Toluene was detected at Well 7D at 3.8 ppb in 1983; however, nothing was detected in this well in 1985. G&M has concluded that contamination in these deeper wells occurred during on-site pumping in the past or is the result of off-site contamination. However, this has not been confirmed by sampling.

G&M has concluded that occurrences of contaminants at UOP are not always related by one common body of contaminated ground water. G&M based this conclusion on the identities and concentrations of the other organic contaminants at various well locations. If a large, singular plume of contamination was present under the site, according to G&M, one would expect to see the same blend of contaminants appearing in most, if not all, of the wells at the site. However, while reviewing the data, CDM FPC found that, in fact, the fingerprints of contaminant families between wells (particularly those in the same areas) corresponded closely in most cases and that the data does not support the conclusion that there is not a plume (or plumes) of contamination at the site. Development of distribution maps, similar to Figure 6, for the most frequently occurring contaminants (or their families) at the site would aid in the resolution of this issue.



SOURCE: Geraghty & Miller, Incorporated

Figure 6

Volatile Organic Compounds In Ground Water
1985 - 1986

UOP Site
East Rutherford, New Jersey

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Finally, even the most definitive source plume could exhibit variation in contaminant concentrations at different wells due to volatilization, biodegradation, adsorption, etc. Also, because there is probably more than one source of contamination at UOP, fingerprints may overlap, further confusing the results.

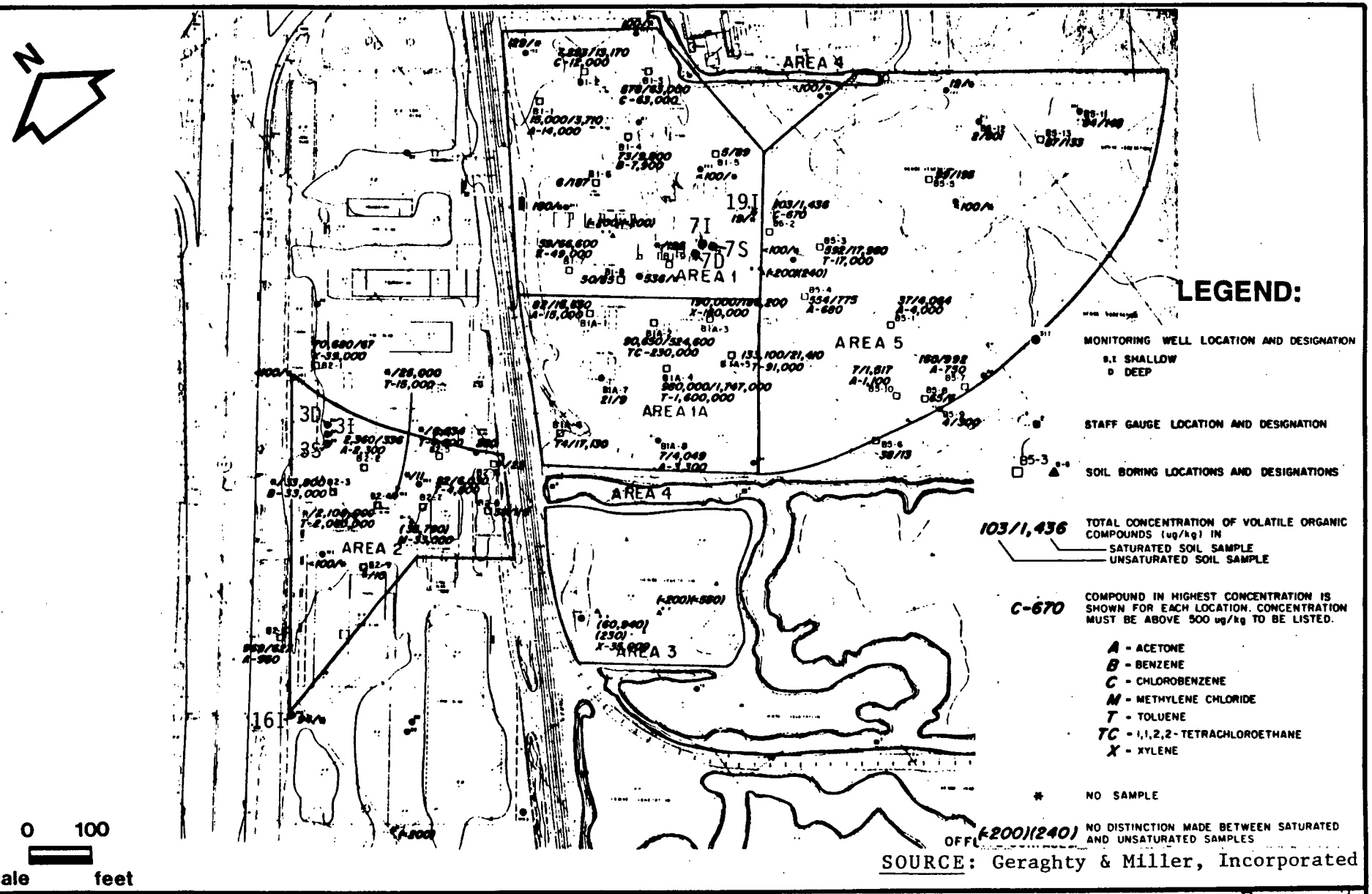
The highest total contaminant concentration for volatile organics found in site soils was detected at over a million ppb in a soil sample from Boring B2-4 which is in Area 1A and 2 (Figure 7). Volatiles were also detected in the blank taken with this sample. VOCs in the ten thousand ppbs were found in all areas of the site.

G&M concluded that the soil is not the principal source of the underlying ground water contamination based on the following information: None of the volatiles detected in the unsaturated soil samples from Well 21I were detected in the ground water at the same location. Also, the presence of toluene at Wells 16I and 19I cannot account for the considerable variety of VOCs identified in ground water samples there. Furthermore, G&M noted that the principal VOCs detected in the soil are toluene, benzene, and ethylbenzene and these chemicals are characteristic of gasoline. G&M concluded that many small releases, rather than a few major ones, have occurred during the decades of plant operation, based on their soil and ground water data. CDM FPC does not dispute that there may not have been one isolated spill at UOP. In all probability, there has been continued contamination over the years. However, the data indicated that the contamination emanates from a few point locations which, in effect, act as isolated sources.

The general absence of detectable organic contamination in the surface water bodies sampled during the Phase I investigation indicated to G&M that the discharge of contaminated ground water to adjoining surface water bodies had essentially no measurable impact on the quality of water in these streams, creeks and drainage channels. However, due to the highly volatile nature of the compounds, they may be in the stream, but only for very short durations. Stream sediments at SS-6 (near the lagoons) contained the highest level of dichlorobenzene (DCB) and total VOCs, verifying that organics are in the stream.

According to G&M, the predominant VOCs detected in the lagoon samples are toluene, benzene, xylenes, ethylbenzene and chlorobenzene. In both lagoons, the total volatile concentration exceeds 100,000 ppb in the top 4 feet, which includes the sludge layer and the underlying peat. Concentrations are one or more orders of magnitude lower in the deepest (saturated) layer sampled. The concentrations of VOCs in Lagoon 2 are generally lower than they are in Lagoon 1. Only one value in Lagoon 2 exceeds 100,000 ppb (333,100 ppb in Boring 15). As in Lagoon 1, concentrations drop off below 3 to 4 feet.

To date, no air quality sampling has occurred at UOP. Although no elevated readings have been detected in air monitoring with a "TIP" during site activities (some values of less than 50 ppm were recorded during drilling in Area 1A), the extent of air contamination by VOCs at the site remains unknown.



SOURCE: Geraghty & Miller, Incorporated

Figure 7

Volatile Organic Compounds In Soils
1983 - 1986

UOP Site
East Rutherford, New Jersey

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3.2.2.2 BNAs

BNAs are present at UOP in the ground water at an order of magnitude less than VOCs (10,000s), with 1,2-dichlorobenzene the predominant constituent. According to G&M, two areas show the highest concentrations of base/neutral extractable compounds in ground water (Figures 8 and 9):

1) near Wells 3I, 13I, and 14I (Area 2), and
2) near Wells 27I, 21I, and 24I (Area 1 and 1A).

G&M suggests that the various base/neutral compounds have not traveled very far in the ground water system. First, unlike the distribution of VOCs where a limited number of the same compounds are present throughout the plumes, the specific BNAs detected during the site investigations frequently vary from well to well. The possibility of small sources with local impact is suggested. Second, the low permeability of the shallow deposits and high adsorption potential of the soils for most BNAs limits the contaminant migration velocity.

In view of the fact that saturated sludge from the lagoons yielded concentrations for total phenols of greater than 20,000 ug/kg, G&M considers the lagoons to be a source area for phenols. However, there is probably more than one source of BNAs at the site.

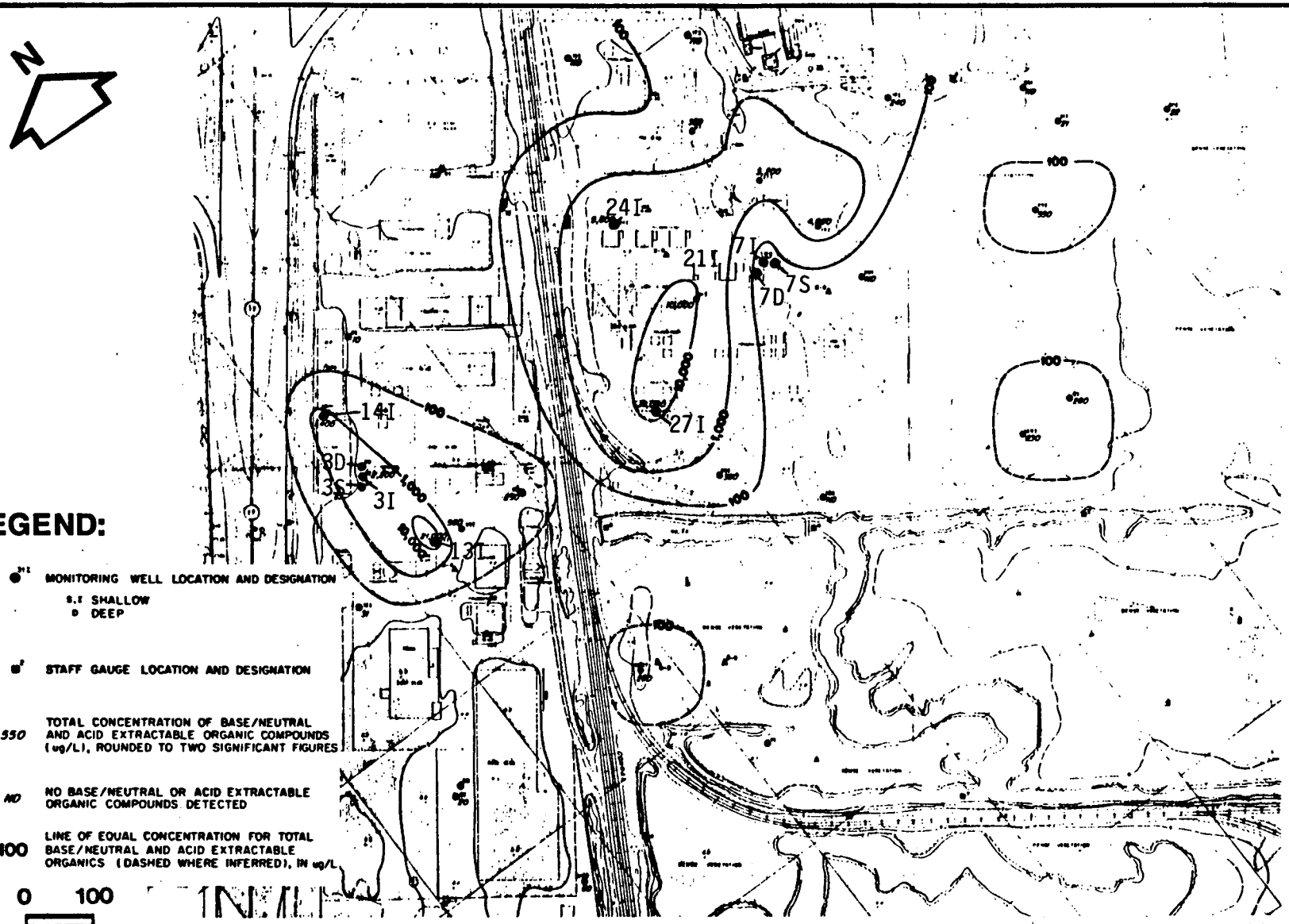
During the Phase II investigation, BNAs were found in surface water at Monitoring Station ST-3 (5,100 ppb), at ST-1 (500 ppb), and at other locations at less than 100 ppb.

All 5 of the sediment samples analyzed during the Phase I investigation contained detectable levels of BNAs with totals ranging from 106,000 ppb (SS-1) in a sample recovered from the creek bed 310 ppb (SS-5) in the sample from the station near Well MW3 (Figure 9).

High levels of BNAs were detected in all stream sediment samples during Phase II. Of the 7 sediment samples analyzed during Phase II SS-6 had the highest BNAs. Sediment samples collected closest to the lagoons (SS-7, SS-8, SS-9) exhibited the greatest concentrations.

Because the channel sediment samples exhibit substantially higher concentrations of base/neutral compounds than surface water and adjacent ground water samples, G&M concluded that it is improbable that either the surface or groundwater is responsible for the chemical quality of the sediments. Rather, the base/neutral compounds were probably sorbed onto sediment particles and transported throughout the drainage system as suspended load or bed load.

In Lagoon 1, base/neutral compounds were detected in 15 of 27 samples tested. The highest value of 68,000 ppb was reported for the 3 to 6 foot sample in Boring 1. In Lagoon 2, the highest concentrations are in the shallow zone, with low or non-detectable values in the saturated zone. The highest values for phenols (24,000 ppb) were detected in the middle zone (unsaturated peat) of Lagoon 1. Acid-extractable compounds were detected in Lagoon 1.



SOURCE: Geraghty & Miller, Incorporated

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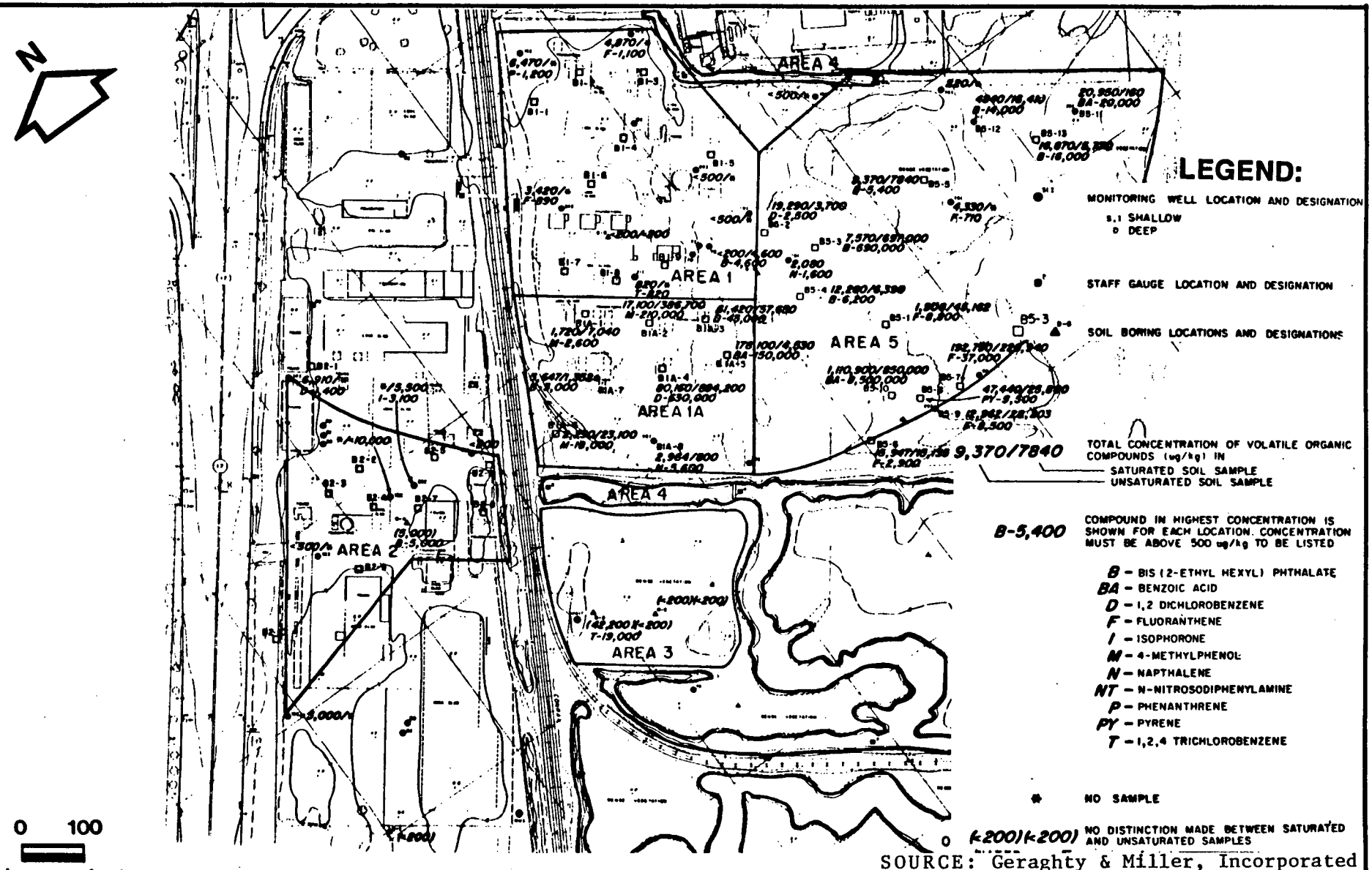
Figure 8
Base/Neutral And Acid Extractable Organic Compounds In Ground Water
1985 - 1986
UOP Site
East Rutherford, New Jersey



SOURCE: Geraghty & Miller, Incorporated

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Figure 9
Base/Neutral And Acid Extractable Organic Compounds In Soils
1983 - 1986
UOP Site
East Rutherford, New Jersey

3.2.2.3 PCBs and Pesticides

Aroclor 1248, a polychlorinated biphenyl (PCB) was detected in the groundwater at Wells 23I (1,100 ppb), 25I (46 ppb), 13I (22 ppb), 15I (13 ppb), and 26I (4.3 ppb) (Figure 10). G&M believes that the PCB levels observed in the groundwater may be the result of its presence in nearby sediments. PCB Aroclor 1248 was also found in sediment samples SS-9 (300,000 ppb), SS-2 (230,000 ppb), SS-8 (100,000 ppb), and SS-10 (13,000 ppb).

During the Phase III Pilot Study for the McGraw Edison PCB Field Test Kit, ERT found a very low correlation between test kit and laboratory results. They concluded that the scatter is probably due to interference from chlorinated organic compounds. According to ERT, the chlorinated organic compound interference problem at the UOP site renders the test kit nearly useless as a tool for defining the extent of PCB contamination. The test kit could potentially be useful in later stages of the project after the PCB contamination is initially characterized.

The laboratory results indicated to ERT that 1) concentrations are uniform across each transect and vary along the length of the stream channels, and 2) PCBs are elevated not only in the 0 to 15 inch samples, but also in the 15 to 30 inch samples.

The origin of the sediments is unknown; however, G&M feels that it is possible that they were transported from one or more off-site locations and deposited at the UOP site during major storms, based on the following information. Well 23I, which provided groundwater samples with the highest concentrations of PCBs, is located close to a major storm sewer. The sewer receives flow from the main drainage channel cutting across the site north of the wastewater lagoons.

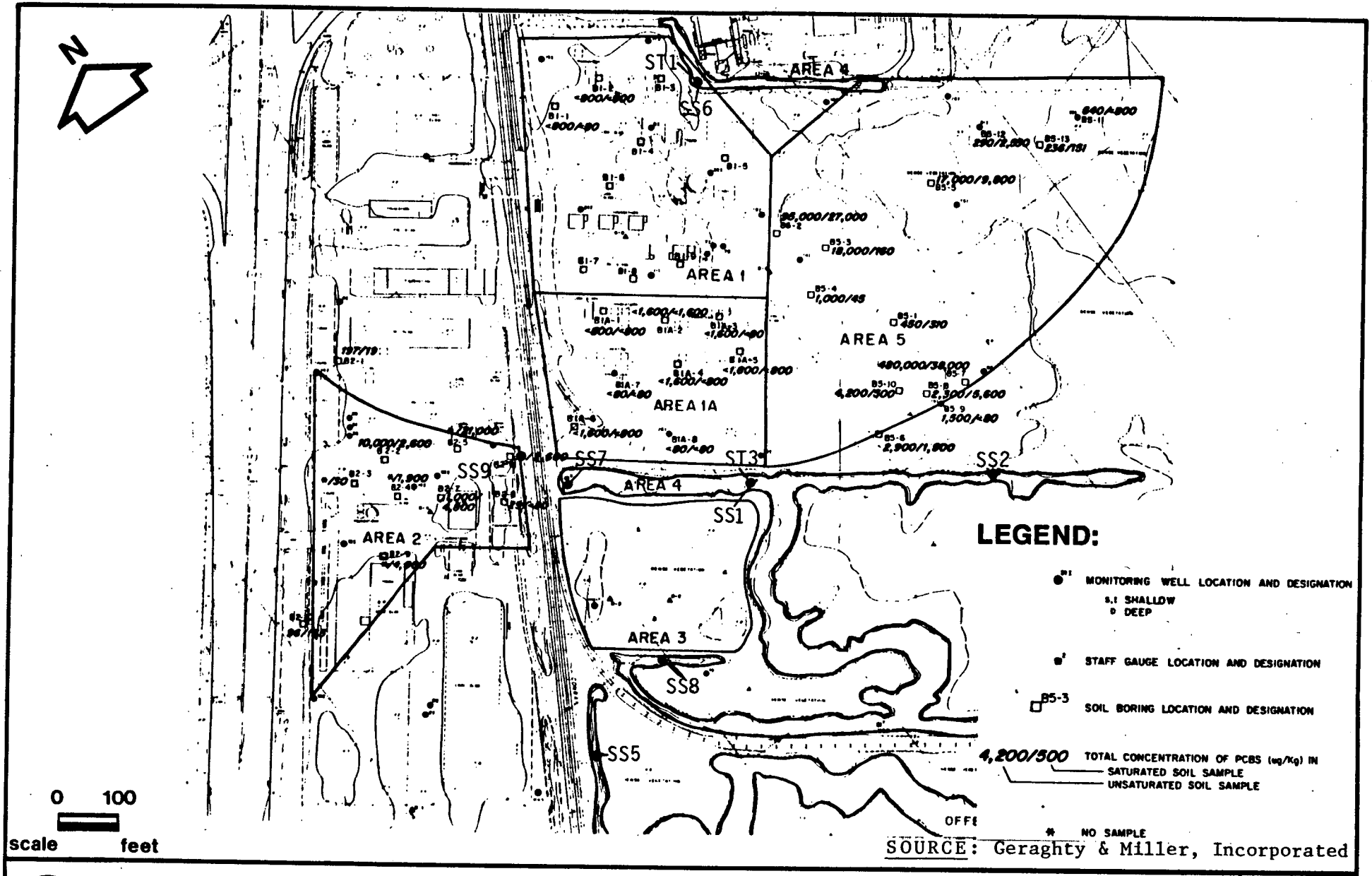
The aqueous solubility of Aroclor 1248 in water is approximately 50 ug/L, indicating that most of the 1,100 ug/L reported in the unfiltered water sample from Well 23I was sorbed onto suspended particulates. As none of the water samples analyzed for PCBs were filtered, the concentrations reported for the other water samples found to contain Aroclor 1248 are unlikely to be representative of actual water-quality conditions. This sampling should be repeated, however, the samples should be filtered.

PCBs were detected at low levels (less than 5 ppm) in samples from Borings 21 and 22, which are outside the lagoons. No PCBs were detected in lagoon samples.

According to G&M, pesticides have not been detected at the site.

3.2.2.4 Inorganics

Samples from a number of wells exhibited concentrations for lead, manganese, arsenic, chromium, and iron exceeding the Federal drinking water standard. Lead was found above the standard of 0.05 mg/l in many samples during the Phase I and II investigations. Chromium was found to exceed the 0.05 mg/l standard at Well 26I where a concentration of 0.15 mg/l was reported. Arsenic was detected at concentrations in excess of the .05 mg/l



SOURCE: Geraghty & Miller, Incorporated

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Figure 10
Polychlorinated Biphenyls (PCBs) In Soils
1986

UOP Site
East Rutherford, New Jersey

standard in samples from Wells 7I (.06 mg/), 11I (.11 mg/1), and MW17 (0.066 mg/1). Manganese was found at concentrations exceeding the 0.05 mg/1 standard in 16 of 18 water samples while iron concentrations exceed the 0.3 mg/1 standard in 14 of 18 wells tested. Mercury and cyanide have also been detected at the site above standards. G&M states that lead, chromium, manganese, and arsenic sometimes occur naturally in New Jersey ground water at levels just above drinking water standards (as is the case here).

The data from the magnetometer survey of Area 5, performed during the Phase III investigation, indicated the presence of a number of magnetic anomalies. Metallic debris, primarily from the facility's demolition, was found in addition to rusted lids and rusted, smashed fragments of approximately 10 to 12 drums. One drum was one-third full of an as yet unidentified solid material.

According to G&M, the results of the magnetometer survey and trench verification showed that Area 5 was not a drum disposal area based on the following information. The few drums that were found at one location were, with one exception, fragmented. An inspection of the soil below the drum fragments showed no indication of unusual colors or stains.

During Phase I, G&M found concentrations of arsenic, chromium, cyanide, lead, manganese, zinc, and cadmium in surface water were consistently greatest at SS-1 and SS-2. The lowest concentrations for all eight of these inorganics occurred in a station established near Well MW3 (SS-5).

The elevated levels of lead and manganese found in most of the surface-water samples is believed by G&M to be a function of the greater suspended/dissolved solids content of surface waters in comparison to groundwater.

G&M concluded that the impact of the old wastewater lagoons can be measured in sediments from nearby locations. Chromium concentrations in sediment are relatively high near the lagoons at SS-2 (4,100 ppm) and SS-8 (5,200 ppm). Chromium was found to be leachable from lagoon soils. Although arsenic values at stream sediment locations are also relatively high (for example, 50 ppm at SS-2), little arsenic is leachable from lagoon soils.

According to G&M, the quality of sediment at SS-6 is different, because the drainage ditch at that location has not been connected to Ackerman's Creek for at least six years. They feel that there is no evidence that contamination from the wastewater lagoons has affected the sediments at SS-6 (chromium in SS-6 sediments is low). However, cyanide is somewhat higher at SS-6 (2.5 ppm) than at other sediment sampling stations. Even though cyanides are generally soluble, none were detected in the surface-water at the same location (sampling designation ST-1). According to G&M, insufficient information is available to propose a source, if any, for the cyanide.

Of the metals tested for, chromium exceeded the criterion (.05 mg/1) in 5 shallows (sludge) samples in lagoon 1. The highest values for cyanide, commonly over 20 ppm, were reported for shallow samples in both lagoons (There is no numerical criterion for cyanide). The results from the zinc

and cadmium analyses were insignificant.

3.2.3 Exposure

An EA at the UOP site, prepared by ERT, was submitted to NJDEP in May, 1987 (ERT, May 1987). This EA addresses Area 1, 1A, 2, and 5 of the UOP site only. CDM FPC found no record of an EA having been conducted on Areas 3 and 4 or on the site as a whole. The ERT EA concluded the following:

- o Organic and inorganic constituents at the site are distributed in the soils and groundwater randomly (exclusively of carcinogenic polynuclear aromatic hydrocarbons [PAHs] and PCBs).
- o Detection of any given compound occurred infrequently.
- o Indicator compounds included arsenic, benzene, bis(ethyl hexyl)phthalate, PAHs, chromium, cyanide, 1,2-dichlorobenzene, PCBs, monochlorobenzene, and lead.
- o The site has little impact on off-site receptors.
- o Volatiles are unlikely to pose a threat.
- o Stream channels may contribute to contaminants in Berry Creek.
- o Carcinogens present more risk than noncarcinogens.
- o The carcinogenic risk of 1.7X10E-7 to 1.2X10E-5 is presented by PAHs, PCBs, and Chromium.
- o Remedial action at the site should consider soils remediation of these three constituents.
- o Chromium is present at "background" levels as listed in New Jersey guidance documents.
- o Remediation of PAHs and PCBs in Areas 2 and 5 are all that is required at the UOP site.

CDM FPC has questions regarding the methods and findings of this EA. In short, we do not concur with the conclusions. Further critique of the EA is in Section 3.3.3.

3.3 CRITIQUE OF UOP CONSULTANT'S WORK

3.3.1 Hydrogeology

The implications of G&M's hydrogeologic investigation are that 1) the rate of release of chemicals from the site is slow due to slow ground water flow and 2) that the deep aquifers in the area are protected from site contamination. Their conclusions are based on 1) the recognition of a peat (or meadow mat) deposit; 2) low laboratory determined permeabilities of soils in the shallow, the existence of a water table aquifer; and 3) a

semi-confined deep aquifer, resulting in an upward hydraulic gradient. The peat deposit may substantially retard the lateral and vertical migration of contaminants in the shallow system locally, but as G&M state, the peat is not present everywhere. The vertical extent of contamination in areas where the peat is present should be compared with the extent of contamination in areas where the peat is absent.

Based on laboratory determined permeabilities, G&M obtained a groundwater flow rate of 5 ft/yr. G&M's interpretation of the ground water data suggest that, in Area 2, ground water flows in a northwesterly direction. An alternative interpretation is that flow has a northerly component. This is supported by the fact that VOCs and BNAs were detected at higher concentrations in Well 13I and 23I than in Well 14I. The implication of such an interpretation is that VOCs and BNAs may have developed a more substantial plume and may be spreading north from Area 2 than has been assumed so far.

Water level measurements from two well clusters (3 and 7) and a significant clay unit found in these wells suggest that the deeper aquifer is confined. An analysis of this situation is necessary due to the fact that contaminants typical of the UOP site (DCE, toluene, and TCE) have been detected in ground water samples from the 2 deep wells (3D and 7D). G&M attribute this contamination to either 1) off-site contamination or 2) on-site contamination during pumping. However, due to the vital importance of this aquifer as a water supply, substantially more evidence will need to be gathered to verify that confined conditions prevail under the present and potential extent of contamination. Some actions that may provide that evidence are described below.

At least 3 more deep wells should be drilled in order to completely evaluate the hydrogeologic condition at UOP. One these wells should be placed slightly downgrade of an area where the shallow system is highly contaminated, specifically in Area 3, near the wastewater lagoons, or in Area 1A, northeast of Ackerman's Creek and southwest of Well Cluster 7. A third additional well should be drilled in an area where the shallow system is proven to be relatively uncontaminated, e.g. north of Area 1A and northeast of Area 2. An analysis of the ground water from this well would act as a background value for determining if contamination in the deep aquifer is due to on-site pumping. These additional wells would also help to determine the extent and thickness of the clay unit which is apparently confining the lower aquifer. At least one more well cluster would help to determine if the upward hydraulic gradient and low permeability of the clay unit is sufficient throughout the site to overcome diffusion of contaminants.

A deep well in this area will present significantly liability to the deep aquifer and should be telescoped. The deep wells should be monitored quarterly to determine if they are influenced by seasonal fluctuations in surface water; this would indicate whether or not the deep aquifer is confined, and whether or not the shallow and deep aquifers are hydraulically connected.

3.3.2 Nature and Extent of Contamination

Although G&M has apparently defined the nature of contamination as required by the ACO, they clearly have not defined the extent of contamination.

Very little is known about the nature or extent of contamination in the deeper aquifer, perhaps the most vital resource affected by contamination at the site, and the most likely exposure pathway. Up to 100 ppm of VOCs were detected in ground water sampled from the deep aquifer in 1985. BNAs have also been found in 3D and 7D. Wells should be placed in the deep aquifer at the focal point of at least two of the 6 areas of contamination to confirm that contamination has not migrated vertically.

The highest VOC and BNA concentrations have been detected in the shallow aquifer at the northern and northeastern boundaries (Area 2 and 1A), but sampling was limited to the site boundary during the investigation. Additional ground water, soil, and surface water sampling beyond site boundaries is necessary to determine the extent of contamination. The shallow aquifer flow pattern supports the need to sample off-site to the north, northeast, and west of the site boundary (Figure 6).

G&M stated that VOCs are notably absent in Area 5. However, the fact that the VOC's are much higher in Areas 1, 1A, and 2 than in Area 5 does not negate their presence in Area 5. The ground water VOC contour map (Figure 6) is misleading. The data suggests that the 1,000 ppb and 100 ppb isopleths in Area 2 may be drawn to the north rather than to the west, as G&M has done. If drawn to the north, then the need to sample off-site is further exemplified. A 100 ppb isopleth could be drawn in the eastern portion of Area 5, around Well 25I. Furthermore, for clarity, if a sample was not taken from a well, this should, in the future be symbolized on the map (e.g. NS for "not sampled"). Finally, it is difficult to place contamination in the Lagoons relative to the rest of the site because they are not located in any of the RI figures.

Although G&M has concluded that a series of unrelated spills are responsible for ground water contamination at UOP, rather than one or a few common sources, CDM FPC finds that there are finite areas with considerably higher concentrations of contaminants than others which point to a probable source. (Unfortunately, little is known of historic practices at the site.) G&M suggests that although the lagoons may be a source of VOC and BNA contamination in the soil and ground water of Area 3, sources have not been determined for inorganic contamination in Area 3 (with the exception of chromium). Furthermore, sources of contamination in all media throughout Areas 1, 1A, 2, 4, and 5 have not been indicated, contrary to NCP requirements.

UOP has gathered a substantial amount of information concerning hydrogeology and nature and extent of contamination indicating several plumes of contamination. However, they have provided very little information on Federal or state requirements, criteria, advisories, or guidance standards which can be related to the levels of contamination detected at the UOP site. These must be established, as stipulated by the NCP, before determining whether and what type of remedial and/or removal

actions will be considered.

It appears that ERT will study on site biodegradation in Area 3. It seems that neither ERT nor G&M will perform an FS of the lagoons or of the PCB contaminated sediments in Area 4. To date, they have not indicated a source for the PCBs, although CDM FPC finds that G&M's data on soil contamination and hydrogeology implicate Areas 2 and 5. The BNAs detected in ground water can be found in upgradient soil samples.

While areas with the highest concentrations of total VOCs in soil and ground water correspond to areas with the highest total BNAs, this is not the case with PCBs. Areas 5 and 2 contain the highest soil concentrations of PCBs.

In the Phase III report, G&M states that inorganics other than manganese and lead were not detected in ground water at concentrations higher than the Federal drinking water standards. However, they neglect to report information from the earlier phases of the investigation, in which lead, arsenic, manganese, chromium, and iron were found at concentrations above the standard. G&M attributes these high levels, in part, to New Jersey's natural resources (minerals), and states that these levels are not uncommon. A reference with background values should be provided to support this statement.

CDM FPC finds that G&M has not adequately investigated the soil-ground water relationship in inorganic constituents. For example, although they state that soil is not a reservoir from which chemicals can leach, the highest chromium concentrations found in soil occur in Area 5 (>1,000 ppm), upgradient from Well 26I, which is in exceeds the Federal drinking water standard.

A map showing the concentrations of each inorganic parameter or at least indicator parameters in ground water samples should be produced as was done for VOCs and BNAs.

The only measurable impact of discharged contaminated ground water on surface water is related to the wastewater lagoons in Area 3. The lagoons are clearly the source of soil, ground water, and surface water contamination and must be remediated.

CDM FPC agrees with ERT's conclusions concerning PCB contamination in the sediments that 1) there is a uniformity of concentrations across the channels and a variation in concentrations along the length of the channels and 2) PCBs are detected as deep as 30 inches in the sediment. However, ERT does not indicate a potential source of PCB contamination in view of the facts that 1) PCB concentrations in soils, according to G&M, are highest in Areas 2 and 5, and 2) the sediments with the highest PCB concentrations are adjacent to and down gradient from Areas 2 and 5.

3.3.3 Exposure Assessment

ERT concluded in the May, 1987 EA of Areas 1, 1A, 2, and 5 that remediation was required at UOP only for PAHs, PCBs, and possibly chromium in Areas 2 and 5. However, CDM FPC finds that several

assumptions were made during the EA that may have significantly affected the results.

The EA considered Areas 1, 1A, 2, and 5 only. However, to develop an FS at UOP, all areas of the site must be considered concurrently. The results of finding in the areas that were considered during the ERT EA could be affected by the presence of contaminants elsewhere (particularly in the calculation of geometric means, etc.).

The EA relies on data from the G&M RI reports, which do not adequately characterize the extent of contamination in the lower aquifer, off-site, or downstream. New data, if collected could greatly affect the results of the EA.

ERT discounted as insignificant some of those contaminants that were detected infrequently. However, all contaminant detected at the site should be carried through the EA process.

An assumption was made that due to the volatility of benzene and chlorobenzene, these compounds were probably not present in the air just above site soils. However, given that these compounds are two of the most toxic at the site, and that they were detected in surface soils (0-2'), air sampling should be conducted to verify their absence.

CDM FPC disagrees with the conclusion stated in the EA that organic and inorganic constituents are distributed randomly in the site soils and ground water. As Figures 6 and 8 (taken from the G&M reports) demonstrate, isopleths can be drawn around VOCs and BNAs in ground water. Trends are also detectable in contaminants in site soils. Also, contrary to EA's statement that detection of any given compound occurred infrequently, many contaminants were routinely detected at the site.

ERT also found that very little impact was posed to off-site receptors. However, given that so little is known regarding the extent of off-site contamination, this conclusion may be premature.

3.3.4 Summary

G&M and ERT have presented findings different from those of CDM FPC upon review of the data. These are summarized here.

The status of technical findings of three phases of work at the UOP site, as stated by G&M in the Phase III report and by ERT in the FS and remedial action work plans appears in left column below. Beside each are the CDM FPC findings.

Geraghty and Miller	CDM FPC
The shallow geologic system from land surface downward is composed of 1 to 8 ft of fill, 1 to 5 ft of meadow mat (in most places), and over 100 ft of layered clay.	From figures 3 and 4, it appears that the site lithology is 1 to 8 feet of fill, 1 to 5 feet of meadowmat (the extent of which is unknown), 1 to 15 feet of sand and clay, 10 to

	15 feet of clay, and 5 to 50 feet of sand. Two aquifers are located at the site: the shallow, saline, highly contaminated water table at 1 to 5 feet below grade and a deeper, semiconfined, potentially contaminated, potable watersource aquifer at approximately 60 feet below grade.
All shallow geologic units have low permeability, and water-table gradients are gentle. Therefore, ground water moves very slowly across the site, typically 5 feet per year and discharges to surface water.	CDM FPC concurs with these findings on the shallow aquifer and also finds that the deeper aquifer is semi-confined and is used upgradient as a water supply. It is not know how the deeper aquifer is used down gradient, nor is the permeability or groundwater velocity of the lower aquifer known.
The water levels in deep wells are generally higher than in the shallow wells, because the area is a groundwater discharge zone in the Hackensack River Basin.	Water levels appeared higher in the deeper aquifer than in the shallow aquifer at the two nested wells on the site, indicating semiconfined conditions at those locations. Whether the aquifer is semi-confined throughout the site is unknown at this time. The shallow aquifer discharges to the Hackensack River Basin.
Consequently, the net upward flow of groundwater protects deeper wells and aquifers in the area from site contamination.	A net upward flow throughout the site has not been established, although it probably exists at the two locations where deep well were installed (3D and 7D, Figure 5). The existence of low levels of contamination in both deep wells may refute the theory that the purported upward gradient is protecting the lower aquifer.

Volatile compounds are the prominent group of organics dissolved in groundwater. They are predominantly present under parts of Areas 1, 1A, and 2 and notably absent under Area 5.	Volatile compounds are the predominant contaminant in the shallow aquifer at up to 210,000 ppb (Well 13I). It is not known what contaminant group is predominant in the deeper aquifer but it appears to be volatiles (<100 ppb TVOCS at Well 3D). They were found in every groundwater location sampled in Areas 1, 1A, and 2, and also detected in several locations in Area 5 at up to 150 ppb (Well 25I). Volatiles are present at over 50,000 ppb at the site boundary and extend for an unknown distance to the northwest and north.
Base/neutral and acid-extractable organic compounds are present in shallow ground water at some locations, but at generally much lower concentrations than the volatile organic compounds.	BNAs are present in the upper aquifer at up to 21,000 ppb (Well 13I) and seem to be located around six areas (see Figure 9). BNAs were also detected in low levels (<50 ppb) in both of the deep Wells. BNAs have been detected in parts per million at the site boundary and extend northeast and and north from the site for an undetermined distance.
Polychlorinated biphenyls (PCBs) have rarely been detected in ground water, and pesticides have never been detected.	PCBs are highly adsorbed by soils and would not be expected in high concentrations in ground water. PCBs were detected in Well 23I, Area 2 (1100 ppb) and in Well 25I, Area 5 (46 ppb) and down gradient from Area 1A. No pesticides have been detected.
Except for manganese, metals are present in ground water under the site only at low levels (using Federal drinking water standards as a point of reference). Manganese is not an expected process or waste metal, and may exist naturally at high levels in the soil and fill.	The following metals have been found in ground water at the UOP site at levels in violation of standards: arsenic, manganese, chromium, and lead. It is not known whether manganese is a naturally occurring metal at the site. Mercury and cyanide have also been detected at the site.

Volatile, base/neutral and acid-extractable organic compounds are present in soil samples from many borings in Areas 1, 1A, and 2.	Volatile organics are present in all areas of the site; at up to tens of thousands ppb. Extremely high levels of volatiles such as toluene, tetrachloroethane, xylene acetone, benzene, methylene chloride, or chlorobenzene can be found in all areas of the site. Soil contamination may extend beyond the property boundary. The vertical extent of volatiles in soils is unknown. Semi-volatiles are also present in extremely high levels in all areas of the site, including benzoic acid, bis(ethylhexyl) phthalate, and 1, 2, dichlorobenzene. BNAs in soils may extend beyond the site boundaries. The vertical extent of contamination is unknown.
Base/Neutral extractable organic compounds and polychlorinated biphenyls (PCBs) were detected in many soil samples taken in Area 5.	BNAs are found throughout the site (see above). PCBs are found in site soils in Areas 2 (10,000 ppb) and Area 5 (480,000). The vertical extent of contamination is unknown.
The concentrations and identities of chemicals in the soil rarely correspond with those in the ground water immediately below. Thus, the investigations have not shown substantial source areas in soil which have a measurable impact on the underlying ground water.	The "hot spots" of contaminants in site soils corresponds well with hot spots in groundwater, indicating soils or the lagoons are probably the sources of contaminants at the site. In some cases, contaminant "fingerprints" vary; however, this is probably due to soil adsorption, volatilization, biodegradation, reaction, or other process occurring at the site.
A magnetometer survey and follow-up verification by trenching in Area 5 showed that the area is not a reposi-	Concur.

tory for buried drums.

ERT	CDM FPC
PCB contamination extends deeper into the stream than had been previously anticipated.	Concurs.
In the proposed stream sediment sampling plan, samples are to be analyzed for PCBs, aromatics, mercury, and chromium.	Cyanide, zinc, arsenic, lead, and cadmium have also been detected in stream sediments and should also be analyzed for.
VOCs are the most abundant contaminant in the lagoons.	VOCs are found in the lagoons at an average order of magnitude (10,000 ppb) higher than BNAs (1,000 ppb).
The EA evaluated Areas 1, 1A, 2, and 5.	The EA should be conducted over the entire site.
The lagoons consist of a sludge deposit underlain by meadow mat or peat which is underlain by saturated clay.	The lagoons and the meadow mat and clay are underlain by sands, containing a prolific aquifer.

4.0 REGULATORY COMPLIANCE

4.1 COMPLIANCE WITH CERCLA AND SARA

To date, there have been no remedies taken at the UOP site. However, a remedial action work plan has been submitted for Area 3, which includes the wastewater lagoons. This plan proposes on-site biodegradation as an alternative to excavation of the lagoon sludge and off-site transport and disposal of the hazardous waste. This is in accordance with SARA in that 1) the remedial action would significantly reduce the mobility of the contaminants, and 2) off-site transport and disposal is the least favored alternative where practicable treatment technologies are available. Unfortunately, it is unclear at this time whether UOP proposes to accomplish bioremediation of the lagoon as a remedial action or whether they will begin a removal action shortly. According to NJDEP, the bioremediation study will satisfy the requirements of an FS. However, this may not be the case since they have not evaluated other remedial alternatives formally, according to regulatory guidance. Therefore, they are not in compliance with the NCP. If UOP wishes to bioremediate the lagoons as a removal action (a good idea), they need to establish that a immediate threat is posed by the lagoons in their present state. It makes sense to remediate the lagoons as soon as possible since they are an agreed-upon source of contamination at the site.

ERT conducted an EA for Areas 1, 1A, 2, and 5. CDM FPC found no documentation of an EA having been conducted at Areas 3 and 4. Before an FS can be conducted at the site, an EA must be conducted for the entire site. The EA is an integral part of the FS and is considered in the development of potential remedial alternatives.

According to NJDEP, community involvement has been primarily with local officials. It is expected that citizen involvement will increase as the cleanup process progresses.

4.2 COMPLIANCE WITH THE NCP

The NCP stipulates that the source and extent of contamination be defined. The analysis thus far indicates that contamination may extend off-site. Thus, areas northwest and north of the site must be sampled in order to adequately characterize the extent of contamination. Substantially more studies of the lower aquifer must be conducted to define the nature and extent of contamination there. Therefore, the extent of soil, ground water, surface water, and air contamination is unknown.

Although G&M suggest that the lagoons may be a source of VOCs, BNAs, and PCBs contamination in the soil and groundwater of Area 3, sources have not been indicated for inorganic contamination in Area 3 (with the exception of chromium). Furthermore, sources for contamination of any type of any medium in Areas 1, 1A, 2, 4, and 5 have not been indicated, contrary to NCP requirements. It is CDM FPC's findings that substantial evidence exists to identify site soils and the lagoons as sources.

UOP has gathered a substantial amount of information concerning

hydrogeology and nature and extent of contamination indicating several plumes of contamination. Although they state that soil and groundwater contamination may be naturally attenuated, they have not provided sufficient information on Federal on State requirements, criteria, advisories, or guidance standards which can be related to the levels of contamination detected at the UOP site. This relationship must be assessed, as stipulated by the NCP, before determining whether and what type or remedial and/or removal actions will be considered.

4.3 COMPLIANCE WITH RI/FS GUIDELINES

It appears that ERT will perform a remedial action of on-site biodegradation in Area 3. It is not apparent whether ERT will perform an FS on the lagoons (area 3) or on the PCB contaminated sediments in Area 4. To date, they have not indicated a source of the PCBs, although CDM FPC feels that G&M's data on soil contamination and hydrogeology implicate Areas 2 and 5.

CDM FPC feels that, before a no-action alternative is chosen for Areas 1, 1A, 2, and 5 (as may be suggested), an FS must be conducted that shows that the levels of contamination determined thus far in these areas will be naturally attenuated to appropriate standards and do not require remediation. Only then can further investigation or remediation of Areas 1, 1A, 2, and 5 be abandoned.

During the risk assessment, ERT considered Areas 1, 1A, 2, and 5 as a single entity, neglecting Areas 3 and 4. In view of the fact that Area 3 is clearly the source of significant contamination at the site, CDM FPC feels that the risk must be re-assessed with the inclusion of Areas 3 and 4. If the exclusion of Areas 3 and 4 during the risk assessment assumed that Areas 3 and 4 would be completely remediated, this should be explained.

5.0 CONCLUSIONS AND RECOMMENDATIONS TO EPA

5.1 TECHNICAL

Before the UOP site is deleted from the NPL, the nature, extent, and sources of contamination will need to be characterized and an EA will need to be conducted on the site as a whole. EPA will need to be involved with the state in negotiating exactly what further studies will need to be conducted to accomplish these objectives.

CDM FPC has found that contamination of the deep aquifer has not been characterized. However, the field work required to accomplish this will be costly and pose significant liability to UOP. CDM FPC recommends that at least 3 more wells be installed in the deep aquifer to confirm that it has not been contaminated and that it is hydrologically protected by the clay unit above. However, this is very expensive and could potentially cause contamination where no problem existed. Therefore, deep wells should be placed slightly downgradient from the worst areas of contamination (Areas 1 and 1A, 2, and 5).

Off-site contamination should be more fully characterized. This involves soil sampling in those directions where contamination leads (north and northeast). At least one of the deep wells mentioned above should be placed off-site to the north-east.

Air sampling should be conducted on-site to support the findings of the EA that significant toxic compounds are not present immediately above the soil.

Surface water sampling should be conducted downstream and off-site to determine the extent of contamination there.

Figures and data summaries should be developed that incorporate the findings of all phases of work to date and all Areas of the site.

The bioremediation studies underway at the site lagoons are technically an attractive way of addressing the organics source there. However, it is unclear at this time how well this action may address the PCB, inorganics, and cyanide in the lagoons.

5.2 REGULATORY

Although NJDEP has stated that the bioremediation studies that are underway at the lagoons at UOP are satisfying FS requirements, CDM FPC finds that they do not. There has not been a formal analysis made of potential remedial alternatives at the lagoons. It is possible that these activities can be conducted as a removal action if UOP demonstrates that the lagoons in their present state pose a threat.

UOP has not characterized the extent or sources of contamination at the site. This is in noncompliance with the requirements of the NCP. Also, it is unclear whether the lagoons will require further remediation subsequent to biodegradation. In either case, an EA will eventually need to be prepared that considers the site as a whole.

DOCUMENTS REVIEWED

ERT, October 1986 through July 1987. Monthly progress reports, UOP site.

ERT, November, 1986. Pilot Study for McGraw-Edison PCB Field Test Kit and stream channel sediment sampling.

ERT, November 12, 1986. Letter to BECM explaining results of McGraw-Edison PCB Field Test Kit Pilot Study.

ERT, January 1987. Revised Pilot Study Report for McGraw Edison PCB Field Test Kit.

ERT, January 23, 1987. Letter to BECM responding to comments from NJDEP concerning 1) the results of the Pilot Study, 2) the September, 1986 cleanup plans for the lagoons, and 3) the November 12, 1986 revised sediment sampling plan.

ERT, February, 1987a. Wastewater Lagoons Remedial Action Work Plan, Revision 1.

ERT, February, 1987b. Stream channel sediment sampling plan, Revision 1.

ERT, May, 1987a. Feasibility Study Work Plan, Areas 1, 1A, 2, and 5, UOP site, East Rutherford, New Jersey.

ERT, May 1987b. Risk Assessment Report, Areas 1,1A, 2, and 5, UOP site, East Rutherford, New Jersey.

ERT, May 29, 1987. Letter to BECM stating that the RA for Areas 1, 1A, 2, and 5 was the final RI requirement of the ACO and that the RI/FS Work Plan report for Area 4 is in progress.

ERT, July, 1987. Wastewater Lagoons Biodegradation Feasibility Analysis and Design Optimization Work Plan, UOP site, East Rutherford, New Jersey.

ERT, July 29, 1987. Letter to NJDEP summarizing analytical data for wastewater lagoons.

Geraghty & Miller, Inc., May 1984. Investigation of Groundwater conditions at the UOP site, East Rutherford, New Jersey.

Geraghty & Miller, Inc., May 4, 1984. Letter to William Wachenfield of Tompkins, McGuire, and Wachenfield Counselors at Law summarizing the results of the Phase I investigation and stating that contamination is unlikely to substantially impact the environment.

Geraghty & Miller, May, 1985. Phase II Investigation, Water and Soil Conditions, UOP site, East Rutherford, New Jersey.

Geraghty & Miller, Inc., and ERT, September, 1986. Work Plan, Allied-Signal UOP Site, East Rutherford, New Jersey.

Geraghty & Miller, Inc., September 5, 1986. Letter to NJDEP commenting on the revision of the Work Plan as per August 13, 1986 NJDEP comments.

Geraghty & Miller, Inc., September 11, 1986. Letter to NJDEP outlining schedule of events planned through October 15, 1986.

Geraghty & Miller, Inc., October, 1986 through July, 1987. Monthly progress reports, UOP site.

Geraghty & Miller, Inc., May, 1987. Remedial Investigation Report, Areas 1, 1A, 2, and 5, UOP site, East Rutherford, New Jersey.

NJDEP, January 27, 1986. Letter to Tompkins, McGuire & Wachenfield Counselors at Law reviewing the deficiencies of the Phase II investigations.

NJDEP, March 26, 1986. Letter to BEERA in references to the selection of appropriate cleanup objectives for UOP, based on the results of the Phase II investigation.

NJDEP, May 9, 1986. Letter to EPA Region II commenting on the March 26, 1986 Phase III Work Plan for the UOP site.

NJDEP, May 23, 1986. Administrative Consent Order.

NJDEP, August 8, 1986. Letter to ERCO granting them approval to perform analytical work for UOP site.

NJDEP, September 26, 1986. Letter, to EPA stating that the September, 1986 Work Plan incorporates NJDEP comments submitted to UOP in August, 1986.

NJDEP, October 7, 1986. Memo to DWR, BET, OSR, ORS, NJPDES, and EPA asking for review of lagoon removal plan submitted by UOP.

NJDEP, October 23, 1986. Stream Encroachment Section, Bureau of Flood Plain Management. Letter to UOP stating that a stream encroachment permit is required for lagoon removal plan.

NJDEP, November 9, 1986. Letter to UOP stating that the lagoon removal plan may require an Army Corp. of Engineers 404 permit.

NJDEP, November 13, 1986. Bureau of Coastal Enforcement and Field Services. Letter to BECM stating that a Waterfront Development Permit and a Tidelands Conveyance must be obtained before dredging takes place.

NJDEP, November 17, 1986. Memo to BECM stating that UOP must obtain either a NJPDES-DSW permit or an NJPDES-SIU permit, depending on discharging procedures.

NJDEP, December, 1986. Community Relations Plan for Hazardous Waste Site Remedial Action.

NJDEP, December 3, 1986. Letter to UOP commenting on 1) the pilot study and sediment sampling plan and 2) the Lagoon Remedial Action Work Plan.

NJDEP, January 29, 1987. Memo to of NJDEP and EPA for review of UOP's response to NJDEP comments of December 3, 1986.

NJDEP, February 3, 1987. Letter to Mayor James L. Plosia of the Borough of East Rutherford confirming the UOP briefing scheduled for February 18, 1987.

NJDEP, February 4, 1987. Memo to NJDEP and EPA to review revised PCB Pilot Study Report.

NJDEP, March 11, 1987. Memo to EPA with copies of slides used by UOP at February 18, 1987 briefing.

NJDEP, July 21, 1987. Internal Memo to NJDEP and EPA for review of Biodegradation Work Plan report.